THE PROGRESS OF PRINTING.

A PAPER

READ BEFORE THE

MANCHESTER ASSOCIATION OF ENGINEERS

(ESTABLISHED 1856)

BY

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Past President of the Association,

ON NOVEMBER 28th, 1885.

MR. JOHN HORSLEY IN THE CHAIR.

MANCHESTER:
"GUARDIAN" PRINTING WORKS, 3, CROSS STREET.
1886.

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THE PROGRESS OF PRINTING.

In times before the Press had blest mankind,
Perish'd unknown the noblest works of mind,
O'er trackless wastes, whence science lent no ray,
And cheerless climes, was genius doomed to stray
His usefulness, as bounded as his fame,
His body dead,—oblivion seized his name,
The eternal essence to its source returned,
Unfelt its blessings, and its loss unmourned.
How changed the auspices of those who wait
In these our days at Fame's celestial gate,
'Tis merit leads them through the sacred bound
Where flowers Elysian deck the holy ground.

—*McCreery's "Press."*

FROM the earliest time when men began to congregate in society, and formed associations for mutual defence and protection, we can trace a desire to prolong beyond the brief period of human life the knowledge of individual existence, and to convey to succeeding generations some memorial of transactions in which, either individually or collectively, they had been concerned.

Thus these longings after immortality originated the engravings on the rocks of Assyria and Nineveh, the writings on the bricks of Babylon, the hieroglyphics on the pillars, friezes, and doorposts of the temples of Egypt, as well as on the sarcophagi which contain the mummied remains of that ancient people.

The country watered by the Tigris and the Euphrates was, according to Scripture, the earliest habitation of the human race, and this district was the original seat of all arts and sciences, and where the very first principles of the art of printing had their first exemplar and origin.

It was from this land of Shinar, then thickly populated, that Abraham and his family, 1900 years B.C., emigrated.

The Bible proves the antiquity of carving documents on stone, for the Divine commands were first issued on stone tablets; and among primitive nations this was considered the best and most durable method of perpetuating records, and doubtless the letters were cut with a sharp instrument of iron, or prepared copper or bronze. Job says (Job xix., 23, 24): "Oh, that my words were now written! Oh, that they were printed in a book! That they were graven with an iron pen and lead in the rock for ever." This clearly indicates that the incised letters were filled up with lead, and, with a transparent substance laid on as a varnish to preserve it against injury by exposure, they would defy decay for ages.*

Mr. Layard, in his most interesting descriptions of his Assyrian discoveries, says he found portrayed on the walls, sculptured in alabaster, the records of the empire, such as battles, sieges, triumphs, &c., and under each were inscriptions engraved in characters filled up with bright copper, describing the scenes represented.

Sir Robert Ker Porter, travelling in Persia in the beginning of this century, says he found engraved on the face of the rocks from Assyria to Persia long inscriptions, some with 600 lines, and all made in cuneiform or arrow-headed characters, such as have been found by Layard in the dried bricks of Nineveh. Specimens of these, from 3,000 to 4,000 years old, may be seen at the British Museum and elsewhere.

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* In Isaiah xxx., 8, we read: "Now go write it before them in a table, and note it in a book, that it may be for the time to come, for ever and ever."

In Jeremiah xvii., 1, we read: "The sin of Judah is written with a pen of iron, and with the point of a diamond; it is graven upon the table of the heart, and upon the horns of your altars."

Herodotus mentions a letter written on plates of stone, which Themistocles sent to the Ionians 500 years B.C. It may be mentioned that by the skill of the modern typefounder these arrow-headed inscriptions have been perpetuated, after the cessation of the use of the character for nearly 2,300 years.

The common mode of keeping records in Assyria and Babylon was on prepared cylinders, bricks, or tiles of clay, which were baked *after* the inscription was impressed. Thus we find Ezekiel, who lived and prophesied near the river Chebar, in Assyria, was commanded to use a tile of similar materials to the bricks generally used, but thinner : "Thou, also, son of man, take thee a tile, and lay it before thee, and portray upon it the city, even Jerusalem." (Ezekiel iv. 1.)

The discovery of the means of marking the dried skins of animals, or some other substitute, with the stile or pen, opened the way to increase and enlarge the amount of information, and to preserve it in a more convenient form than the rock, pillar, or brick. In Scripture we have the roll of the Prophet distinctly specified, and on some of the tiles discovered in Nineveh is portrayed a scribe, employed in marking on a roll of some apparently soft substance.

After a long period, the subsequent discovery of manufacturing a portion of the cotton plant into paper, as well as the application of various substitutes, woods, wax, bark, seeds, mallow or palm leaves, all of which were used for public or private convenience, contributed to accumulate and preserve knowledge, though paper of straw, cotton, and of the papyrus failed from its speedy wear ; and if parchment skins had continued to be the only material, the rapid production of copies must have been almost an impossibility. But, fortunately, the linen rag was accidentally discovered as a suitable material for making paper, and thus the true material seemed to have been obtained to receive the thoughts of mankind, and transmit them almost imperishably to posterity. The credit of this discovery may be given to the Spanish Arabs. In the Escurial, in Spain, several MSS. of cotton paper as early as A.D. 1009, and of linen paper of the date

A.D. 1106, have been discovered. Stow, however, says that cotton paper was made about A.D. 1000, and paper from rags about A.D. 1319 Sir John Spielman made white paper at Dartford in 1509.

From a quotation found in the writings of the celebrated Chinese Emperor Van Vong, who flourished 1120 years before Christ, which says, "As the stone Me, which is used to blacken the engraved characters, can never become white: so a heart, blackened by vices, will always retain its blackness,"—(the word "Me" signifies ink in the Chinese language,)—it is thought by some writers that printing was known to the Chinese more than three thousand years ago; but it is, I think, quite safe to say, that according to Chinese chronology, the art of printing was discovered in China about 50 years before the Christian era under the reign of Ming Tsong I., the second Emperor of the Tartarian Dynasty, and the art of paper making about 145 years afterwards, before which period they had been accustomed to transcribe or print their writings on silk or cloth cut into the form of leaves.

It is very probable that the Chinese have been in the possession of the art of printing before the Western nations, and possibly they may have derived their information from the practices of the Ninevites and Babylonians; but the Chinese never seem to have advanced beyond the style of *block* printing, and as there is no evidence of the Chinese having communicated any knowledge of their art of printing to the Western nations, we may leave them, and confine our remarks to the Western nations; and to the Romans we must, I think, accord the honour of being the first people to understand the art of printing, or taking impressions from letters of metal on to a soft flexible substance, such as parchment; for in the British Museum is a *sigillum*, or signet, or stamp, found near Rome, and formerly in the possession of the Duke of Richmond, and from the appearance of the metal, which is brass, it is thought to be of the time of the Higher Empire. The face of this metal signet is about two inches long, by about eight-tenths of an inch wide, and on the back of it is

a ring attached to serve as a handle. On the face of it is an inscription comprised in two lines, the letters of which are Roman capitals of good proportion, and are with the rim all exactly the same height, and as the letters are *reversed*, and the part that has been cut away is very rough, and uneven in its depth, it is quite evident that it was made for making an impression on some thin even substance, and as the letters are soft, it could not have been used as a stamp on metals; and as the "field," or the part cut away, is rough and uneven, it could not have been a stamp for wax, or other soft impressible substance, so we are led to the inevitable conclusion that it was used for stamping, or printing with ink, on paper or other even substance. Impressions have been taken from it with modern printing ink, and a good clear impression has been obtained, showing the following :—

CICAECILI
HERMIAE.SN.

If this was printed in the modern way it would be thus :—

C.I.CÆCILII HERMIÆ SIGNUM
(Caius Julius Cæcilius Hermias, signum.)

Thus it is most probable this belonged to some Roman official, who used this stamp to impress his signature instead of, or to save himself the trouble of, writing, and this must be allowed to be the most ancient sample of printing known. I have seen a somewhat similar stamp of bronze, bearing a Greek inscription, belonging to the Antiquarian Society of Newcastle-upon-Tyne, and it is thus apparent that the very essence of printing was known to the Romans, for they would have had nothing to do but to make a stamp with lines three or four times as long, and with twenty lines, instead of two, to have formed a frame of types that would have printed a whole page.

It seems strange that the Romans—as sagacious a people as any in the world—should not have discovered the use of *separate types*, in which the whole art of modern printing consists, from the use of such signets as that just described. In later ages wooden blocks were cut large enough for a page, being simply the Roman idea of signet stamping on a larger scale.

Cicero, in his book "De Natura Deorum," has a passage from which it is thought by some the moderns took the hint of printing, for that author orders the types to be made of metal, and calls them FORMÆ LITERARUM, the *very words* used by the first printers to express them.

It is plain from Virgil that brands, with letters of the owner's name, were in use in his time for the marking of cattle. About a month ago only, a discovery was made during the examination of the Archduke Rainer's papers in Vienna of a strip of Arabian paper dating from the ninth century, and containing a woodcut, with ornaments and initials. This relic shows that the art of wood-cutting was probably of Arabian origin, or that it was at all events known to the Arabs in the ninth century.

It is asserted by some, A.D. 1285 was the date when engraving on wood blocks was discovered in Europe; but it was towards the end of the fourteenth century that wood blocks were prepared for printing, for in 1392 cards were made for Charles VI. of France, which evidently had been impressed from a wood block.

In the fifteenth century we find not only were cards printed, but books called block books were made, and the earliest block book known bears the date of 1423, and is in the possession of Earl Spencer; it contains a very curious woodcut of St. Christopher carrying the Infant Saviour across the sea. This book was found pasted and within the covers of a Latin manuscript of the year 1417, discovered in the ancient convent of Chartreuse of Buxheim, near Memmingen, Germany.

Another book thus printed, called the "Biblia Pauperum" (the Bible of the poor), was supposed to have been executed between 1420 and 1430, and contains from forty to fifty leaves.

The mode of multiplying copies having been achieved by means of printing from carved blocks, this at length gave birth to the idea that *every* letter and character throughout a work might be made capable of re-arrangement, and thus be brought to form all the succession of pages belonging to any work, instead of doing it by interminable labour of cutting in solid wood every

letter, figure, and page that required to be printed. Thus, by a natural gradation of human ingenuity, the cutting or engraving of whole pages on entire blocks was followed by the improvement of cutting the letters separately on wood; the next step after which was to engrave them separately on metal, and this was succeeded by forming matrices and moulds for casting each single letter.

After the ground work of the art of printing had been laid, its rise towards perfection was rapid, for little more than thirty years elapsed from the printing of the "Biblia Pauperum" from wooden blocks to the time when Gutenberg and Schoeffer had perfected their cast metallic types, for—

Printing from wooden blocks was invented about		1422
,, ,,	letters cut separately on wood ,,	1438
,, ,, ,, ,, ,,	,, metal ,,	1450
,, ,, ,,	cast in moulds ... ... ,,	1456

Thus the invention of printing was at first rude and simple, consisting of whole pages carved on blocks of wood, and only impressed on one side of the leaf; the next step was the formation of moveable types in wood, and they were afterwards cut in metal, and finally rendered more durable, regular, and elegant, by being cast or founded.

It is a curious fact that in the earliest days of printing it was quite as much used as the *counterfeit* of, as the substitute for, writing, being, as it were, the *fac simile* of the handwriting of the most approved scribes of those times; and in 1460 an artist was accused and tried for witchcraft for offering for sale a number of bibles which so nicely resembled each other in every particular that they were deemed to surpass human skill.

It is not at all surprising that an art so beneficial to the human race should have many claimants for the honour of being its founder, and a controversy has arisen concerning the first discoverer of the art of printing between the towns of Haerlem, Mentz, and Strasburg, each town attributing it to their own countryman. The dispute, however, says Archdeacon Coxe, has

turned rather on words than facts, and seems to have arisen from the different definitions of printing. If we estimate the discovery from the invention of the principle, the honour is due to Laurence Coster, a native of Haerlem, who first found out the method of impressing characters on paper by means of carved blocks of wood, about the year 1422; but if moveable types be considered the criterion, the merit of the discovery is due to John Gutenberg, of Mentz, about the year 1438; and Schoeffer, in conjunction with Faust, was the first who founded types of metal, about 1456.

In 1450 Gutenberg, then in partnership with John Faust, printed in large cut metal types their first work, the celebrated Latin Bible (now called the Mazarin Bible, being found in the library of Cardinal Mazarin in the middle of the last century). Faust, having dissolved his partnership with Gutenberg, with the assistance of Peter Schoeffer, finished printing in August 14th, 1457, a beautiful edition of the Psalms. This book is the first known to be extant which has the name of the place where it was printed, the name of the printers, as well as the date of the year when printed.

To William Caxton we are indebted for the direct introduction of the art of printing into England. Born in 1412, he was apprenticed to an opulent merchant in London, went to the Low Countries in 1442, and remained abroad for nearly thirty years, during which time he made himself master of the art of printing.

The first book known to be printed in *English*, and by Caxton, is called "Recuyel of the Histories of Troy." This was printed in Cologne in 1471. The first book printed in England was by Caxton, at his press in, or adjoining to, Westminster Abbey, in 1474, and was called "The Game at Chess." Caxton, the first English printer, died probably in 1491.

The art of printing soon attracted the notice of the prominent men of the day, for we read that the monks of that time, many of whom were very ignorant, became alarmed at this new power of spreading knowledge; and the Vicar of Croydon, preaching

at Paul's Cross, is reported to have said: "We must root out printing, or printing will root out us." While on the other side of the Channel a French poet wrote:—

I've seen a mighty throng
Of printed books, and long
To draw to studious ways
The poor men of our days;
By which new-fangled practice,
We shall soon see the fact is—
Our streets will swarm with scholars
Without clean shirts or collars,
With Bibles, books, and codices,
As cheap as tape for bodices.

The number of books printed on the Continent and in England in the fifteenth century were 8,395, and these were printed at the following places:—

Augsburg	256	
Basle	320	
Bologna	298	
Cologne	530	
Florence...	300	
Leipsic	351	
Louvain	116	
Mentz	134	
Milan	629	
Nuremberg	282	
Paris	751	
Rome	925	
Strasburg	526	
Venice	2,835	— 8,253 on the Continent.
London	31	
Westminster	100	
Oxford	7	
St. Albans	4	— 142 in England.
	8,395	

Thus England in the fifteenth century only printed one fifty-sixth part of the books printed in Europe, and though at this early period she contributed so small a portion to the literature of the world, no nation has since made such rapid and effectual strides in the promotion of knowledge, for who can comprehend the

blessing conferred on the human race during only the past 81 years by that one single society called the British and Foreign Bible Society, who have printed in that period no less than 32,779,623 Bibles, 49,306,164 New Testaments, and 22,111,178 portions of the Bible, or a total of 104,196,965 books up to March 25th, 1885.

It was in the year 1535 that the first edition of the *whole* Bible was printed in the *English* language, being the translation of Miles Coverdale, and printed either at Paris or at Marsburg, in Hessia, by Richard Grofton and Edward Whitchurch. Six copies of this first complete English Bible were presented to Archbishop Cranmer and Lord Cromwell.

It is very remarkable that the art of printing very quickly attained to such a state of perfection that almost from the time of its introduction it arrived at a degree of technical perfection which has hardly since been surpassed, for we find that some of the earliest specimens of books printed by Gutenberg and his contemporaries in the second half of the fifteenth century are equal to the work of modern times, and, as a matter of fact, the art of printing remained almost stationary for three centuries, the social and intellectual conditions of the period making small demands on its progress, and printing, like many other crafts, was hampered and restricted by rigid trade customs.

McCreery, in his poem of "The Press," says:—

O Mentz, proud city, long thy fame enjoy,
For, with thy PRESS, thy glory ne'er shall die;
Where Gutenberg, with toil incessant, wrought
The imitative lines of written thought,
And, as his heart a nobler effort made,
The sweeping lever his commands obeyed.
Elastic balls the sable stains supply,
Light o'er the forme the sheeted tympans fly;
The beauteous work returning leaves unfold,
As, with alternate force, the axle rolled.
His bosom now unbounded joys expand,
A printed volume owns his mighty hand;
The curious work, from sculptured blocks imprest,
The rising glories of his art confest.

The stubborn block, with rude unchanging form,
One end could answer, but one task perform;
Till Faust, with all his powers of genius ripe,
Struck the first die and cast the moving type,
That ever, as the curious artist will'd,
In some new station some new office fill'd.
With ancient Mentz, our central point of art,
In the proud race the neighbouring cities start;
Spreading, as light diverges from its source,
The great invention through a distant course.

It is very certain that long before printing was discovered there had existed something like a newspaper, for the Chinese have for above 1,000 years published in Pekin weekly an official newspaper printed on silk.

In the days of Cicero, we read of a daily newspaper, the "Acta Diurna," being issued, recording the chief occurrences of public or private note. Thus we find—

On the 26th of July, thirty boys and forty girls were born at Trimdehus' estate at Cuma.

At the same time a slave was put to death for uttering disrespectful words against his Lord.

The same day a fire broke out in Pompey's gardens, which begun in the steward's apartments.

Ovid, who was born 43 B.C., and died A.D. 18, notices these, and the desire of the Roman people for news, as follows :—

Hither in crowds the vulgar come and go,
Millions of rumours here fly to and fro,
Lies, mixed with truth, reports that vary; still
The itching ears of folks unguarded fill,
They tell the tale,—the tale in telling grows,
And each relater adds to what he knows.
Rash error, light credulity are here,
And causeless transport, and ill-grounded fear,
New raised sedition, secret whispers, blown
By nameless authors, and of things unknown,
Fame, all that's done in heaven, earth, ocean views,
And o'er the world still hunts about for news.

Mr. Chalmers, in his life of Rudiaman, says : "It may gratify our national pride to be told that mankind are indebted to the

wisdom of Queen Elizabeth and the prudence of Burleigh for the first printed newspaper." In the Sir Hans Sloane's MSS., preserved in the British Museum, are three copies of "The English Mercurie," "published by authority for the purpose of preventing false reports." One of these, dated July 23rd, 1588, gives an account of the Spanish Armada being seen in the Chops of the Channel making for the entrance with a favourable gale. These newspapers were printed in London by Christopher Barker, the Queen's printer. The genuineness of these newspapers has been questioned by some who think they have been printed later.

To show the style of printing at this period, I have brought for your inspection from my own library the following books printed by Christopher Barker: A form of prayer printed in 1574, a Bible printed in 1575, a Concordance printed in 1578, a Psalter (with music) printed in 1587; also a work by the Warden of Winchester (Bilson) and printed by John Jackson and Edmund Bollifant in 1586. These books you will notice are in "black letter" or old English letters, and for 300 years of age are very clear, good specimens of printing in Queen Elizabeth's reign.

In 1598 there appeared a publication, more like an annual register than a newspaper, called the "Mercurius Gallo Belgicus," printed in Latin.

During the excitement of the Thirty Years War a newspaper was published in England (considered by some as the *first* English newspaper) in 1622, called "The Certain News of the Present Week." This was issued weekly. From this time forward newspapers grew apace, and had short or long lives, as public taste and favour decreed. In 1770 the House of Commons failed to carry a measure to restrain the publication of their debates, and this fact gave a character and importance to the Newspaper Press it had not previously possessed. Following this, the era of the French Revolution, commenced in 1789—a few years after the close of the American War of Independence—the Newspaper Press assumed importance, and was looked upon as the powerful and decided advocate of the abstract principles of right.

At this period the printing press in use for newspapers could print 250 sheets per hour; but the impetus given towards the end of the last century to the industrial arts by the introduction of the steam engine, and the development of mechanical engineering generally, required a power of printing newspapers beyond the reach of the most expeditious hand-press work; and to meet this demand Earl Stanhope improved the ancient printing press—which for three centuries had been virtually untouched—by his invention of the link and lever printing press, being the first press made in iron, the plate being large enough to print a whole sheet at once instead of requiring a double action. This press became the type of machines—modified and improved by others—which, as hand presses, or so-called platen machines worked by power, have been, and by many even to-day are, considered the most efficient presses for the highest degree of perfection in printing.

However, this type or form of press having the principle of applying a flat plane moving parallel to itself and to the type forme, was attempted to be improved upon by William Nicholson, editor of the "Philosophical Journal," who, in a patent dated April 29th, 1790, described a method of using the surface of rotating cylinders instead of the flat plane of the platen. He proposed to pass a table containing the type between an upper and a lower cylinder, the former carrying the paper, and by means of cog wheels or straps to act upon the table so as to draw it backwards and forwards when set in motion, the inking being done by cylindrical rollers which passed over the type as the table moved to and fro.

In another arrangement he suggested imposing the type, which was to be tapering, on one cylinder, whilst the paper was held and pressed against the type by a second cylinder, both moving at the same speed.

A further arrangement consisted of a pressing cylinder holding the paper, which was to be rigidly united and geared into a rack, on a long table on which the type was placed, and thus the printing was to be done whilst the table moved to and fro.

It is strange, however, that although Nicholson's patent embodied all the important elements of our present printing machine, such as rotating cylinders, cylindrical inking rollers and distributors, grippers, &c., it was not turned to any really practical account, and twenty years more had to elapse before printing by machinery became an accomplished fact, and this honour is due to a clockmaker in Saxony, Frederick Koenig (or König), who spent years in his native place in improving the printing press, but failed to get his countrymen interested in his project, and so in 1807 he came to London, and, having received pecuniary support and secured the aid of a gifted mechanical engineer named Bauer, he in 1810 patented an arrangement for working by machinery an ordinary platen machine. This, however, was abandoned, and in 1811 he worked out and secured a patent for using a single cylinder for communicating pressure instead of a flat plate; but he was met by a serious difficulty in suitably inking the type of his quick working machine; but two years after Messrs. Bacon and Donkin invented the treacle and glue composition roller, a most important acquisition to the printer, superseding the ancient stuffed, round-formed ball.

Mr. Walter, *The Times* proprietor, had one of König's new machines secretly put down, and on Monday, the 28th of November, 1814, exactly 71 years ago this very day, *The Times* was first published by steam-impelled machinery, and the new machine printed 1,100 copies per hour. In this machine the forme of type traversed horizontally under the pressure of the cylinder, to which the sheet of paper was closely held by means of a series of endless tapes.

The success of this first steam printing machine speedily brought out from able engineers further improvements, and the securing of the types or plates upon the cylinder occupied much thought, and various methods were suggested. Nicholson's idea was to give the shank of the type a shape like the stone of an arch; Messrs. Donkin & Bacon by attaching the types to the sides of a revolving prism; but Cowper took out a patent for *curving* the stereotype plate, and thus fixing it on the cylinder in a perfectly secure manner.

König's machine was superseded by one made by Applegarth and Cowper, which turned out 10,000 copies per hour of *The Times*; this, in its turn, was supplanted by one by Hoe. A gigantic one on this principle was made in our own City of Manchester by Whitworth in July, 1859; it had ten impression rollers, and produced 18,000 copies of *The Times* per hour.

This machine, however, had to give way for further improvements in the famous "Walter" press, which prints both sides of a continuous roll of paper. The paper is fed from a reel into a series of small cylinders, the two last of which are covered with flannel and kept damp. It is then passed between the first and second of four cylinders raised above each other, the top one being covered with the stereotype casts from the first four pages of type, and the lowest cylinder with the casts of the remaining four pages. In passing between the first and second cylinders the paper receives the impression on one side; it then passes backwards between the second and third cylinders, and, resuming its forward direction in passing between the third and fourth, receives the impression of the four remaining pages on the other side. Then the sheets pass through a folding machine, and the numbers recorded. This press requires two attendants and prints 12,000 per hour.

The limits of this paper, to say nothing of the trial of your patience, prevent me from even the naming of a host of inventors and improvers of the printing press during the last 60 or 70 years, and its adaptation for book and the numberless other forms of printing; nor have I time even to allude to such interesting branches as type moulding, type composing, paper making, lithographic and other machines, all forming important adjuncts to printing machines—to say nothing of that grand labour-saving system of stereotype cast plates and other most interesting subjects; so I must restrict myself to one branch merely, viz., the printing of newspapers; but I will not attempt to weary you by even a recital of honoured names who have laboured to perfect this branch of printing, but I will confine my remarks to a description of one local printing establishment, the proprietors

of the *Manchester Guardian* having, in response to my request on your behalf, most courteously and promptly given permission for our members to visit their large and splendid model printing works, after the reading of this paper; and by their kindness and with the valued assistance and hearty co-operation of their consulting engineer (Mr. F. B. Welch), and the resident executive engineer of the *Guardian* (Mr. Davies Braithwaite)—to both of whom I tender my warmest thanks—I have been enabled to make a close inspection of the *Guardian* printing establishment, and have been allowed not only to make notes, but to give you this evening a somewhat detailed description and illustrations of the machines and the various processes there to be seen in operation. This printing plant being all new, and of the most recent character – in fact, some of it perfectly unique—you will have placed before you the highest state of perfection in printing machinery, &c., up to this present date of November 28, 1885. Before proceeding further, however, allow me to give you a few lines of a poet :—

> Blest invention, to God alone the praise
> For gifting man this noble art to raise.
> From thee what benefits do men possess,
> The Pulpit, Bar, and Stage all now confess.
> Trace the historic page, and view the time
> Before thou visited our native clime.
> The want of thee kept Arts and Commerce low;
> Without thy aid, how little could we know.
> Thou art the means by which we gain redress—
> Our nation's bulwark is the British Press.

It may be of interest here to remark that the art of printing was first introduced into Manchester in the year 1588 (the period of the Spanish Armada), by an itinerant printer, named Penry, who went up and down the country with his press secretly publishing libel and proclaiming sedition. In Manchester his press was found, near Oldham Road, and destroyed by the fifth Earl Derby, who then lived at Alport Town, Deansgate, his house standing in a park of 100 acres, now covered by the Central Railway Station, &c.

The first *book*, however, printed in Manchester was in 1719, and called "Mathematical Lectures." This was printed by Roger Adams somewhere near the Parsonage. This printer also in 1719 printed and published the first newspaper in Manchester, entitled the *Manchester Weekly Journal*, price one penny ; this paper ceased to exist in 1726.

In 1730 a Mr. Henry Whitworth published a weekly newspaper, price three-halfpence, called the *Manchester Gazette*, changed in 1737 to *Manchester Magazine.*

Mr. John Bury, in 1738, a grocer in the market-place, published the *Lancashire Journal.*

In 1752 Joseph Harrop published the *Manchester Mercury.*

In 1754 Messrs. Schofield & Turnbull printed the *Manchester Journal.*

In 1762 Thomas Anderton printed the *Anderton's Manchester Chronicle.*

In 1771 John Prescott printed the *Prescott's Manchester Journal.*

In 1781 Charles Wheeler printed the *Manchester Chronicle.*

In 1792 Messrs. Faulkner & Birch printed the *Manchester Herald.*

In 1803 James Edmunds printed the *Manchester Telegraph and Weekly Advertiser.*

In 1803 Joseph Aston printed the *Argus.*

In 1803 a newspaper called the *Mercantile Gazette and Liverpool and Manchester Daily Advertiser* was the first attempt out of London to start a daily paper.

In 1803 a theatrical paper was printed (the *Townsman*) by Watson.

In 1804 Mr. Harrop published the *British Volunteer.*

In 1805 Joseph Aston printed the *Mail*, price sixpence.

In 1809 Joseph Aston printed the *Manchester Exchange Herald.*

In 1817 Messrs. Haworth, Cowdray, & Rathbone printed the *Manchester Courier.*

In 1818 Thos. Rogerson published the *Manchester Observer.*

In 1818 Wilkinson published the *Spectator.*

In 1819 John Leigh printed the *Recorder.*

In 1819 Aston printed the *Patriot.*

Two years later saw the birth of the most important provincial paper of the present day, for the first number of the *Manchester Guardian* was issued on May 5th, 1821, and printed and published at No. 29, Market Street, by Mr. J. Garnett. I was fortunate enough a few days ago, by the kindness of a friend, to be allowed to peruse a copy of the first issue of this now very influential, independent, and widely-circulated newspaper, and I found the pages to measure each 22 inches by 17¼ inches, with four pages (like the *Evening News* of to-day, but smaller in size), and the price per copy was sevenpence, having a government duty stamp of fourpence ; it was published weekly.

In the editor's leader, in laying the first number of the journal before the public, amongst other remarks I find the following:—

> We are entering upon an undertaking of an important and responsible character, and the duties of which we cannot but estimate highly. When the influence of the periodical press upon the public morals and conduct is so great as at the present time, he who connects himself with it ought not to regard as an indifferent matter the principles he may attempt to disseminate, or the conduct he may endeavour to induce. His first care should be that his pages are not stained by anything offensive to correct moral feeling; his next, that the political opinions he promulgates are such as will tend to advance the social prosperity of his country.

And in the advertisements for a sale of a house in Ancoats, besides shippons, milkhouse, &c., there is an excellent garden well stocked with *fruit trees*, &c.

But this Association will be specially interested in one which I give you in full. The advertisement is headed by a woodcut of some toothed wheels with only *three* arms.

> Richard Roberts, lathe, screw, screw engine, screw stock, &c., &c., manufacturer, respectfully informs cotton spinners, ironfounders, machine makers, and mechanics in general that he has cutting engines at work on his new and improved principle, which are so constructed as to be capable of producing any number of teeth required. They will cut bevil, spur, or worm gear, of any *size* and *pitch* not exceeding 30 inches diameter, in wood, brass, cast iron, wrought iron, or steel, and the teeth will not require filing up. Division plates, quadrants, &c., accurately divided, or additional numbers put in old plates,

N.B.—R. R. cuts, on his improved screw engine, screws of all sorts, pitches, or sizes, with the greatest accuracy. Manufactory, New Market Buildings, Pool Fold; house, 5, Water Street, Manchester.

I find also a draft of a bill for Parliament to prevent the smoke nuisance "from furnaces of steam engines," while in foreign news is the report: "Brought by a free trader from the East Indies," that Napoleon Buonaparte on the island of St. Helena "was in very good health," and was much satisfied with his new house, and spent much of his time in looking after its decorations. While among local news is the announcement that a colony of rooks had settled amongst the trees in the garden of Mrs. Hall, at the top of King Street, Manchester, and that in some of the nests there were young birds.

I must now ask you to accompany me in imagination, as you will so soon do in reality, through the magnificent pile of buildings, of so unique, yet massive, grand, and substantial a character, worthy of being placed, as in matter of fact they are, directly opposite the main front of the world-renowned Manchester Royal Exchange, and while viewing the elegance and taste, combined with noble solidity, of the exterior of the new home of the *Manchester Guardian*, you will find that the spirited owners of our leading journal have carried into all the interior arrangements the same spirit of determination to have the most recent, labour-saving, quick-producing, and absolutely perfect appliances and machinery that unbounded capital, immense experience, and the highest talent could secure.

On entering by the main entrance hall in Cross Street, we are struck by the beauty and adaptability of the various commercial and business offices, being of noble proportions, the whole of the woodwork in carefully selected light oak, and the rooms are furnished in admirable taste; while on the upper floors are the various rooms set apart for the use of the editors, library, reporters, telegraph staff, compositors, &c., showing much consideration in their arrangements, being most suitably furnished and remarkably well lighted both by day and by night, and possessing that rare blessing so seldom found in a printing

establishment, *good ventilation;* and throughout the vast building we see in the various appointments a blending of convenience and comfort, elegance and efficiency, economy and expedition; while in harmonious combination are found things that are unique but useful, thrifty yet thorough, snug yet substantial, and concise yet complete.

The connection between the general offices and the mechanical department is carried out by a complete system of pneumatic tubes (the same as is used in the Post Office). These are a series of lead pipes, $2\frac{1}{4}$in. diameter internal bore, going from one part of the establishment to another.

The carriers in which messages are placed are propelled to and fro by means of compressed air, or drawn by a vacuum. One of these pipes is connected with the York Street Telegraph Office, and has an exceedingly ingenious double-acting valve, the invention of Mr. Willmott, of the General Post Office, London.

The system throughout the building is most complete, as messages can be sent direct from the advertising offices to the compositors, and back again, and to the various editors, taking only a few seconds in transit.

The engines connected with the system are of a somewhat novel arrangement, being in appearance of the marine type, as the space was limited, having one 16in. steam cylinder, which is lined with a cold blast cast iron liner, and the space between the liner and the main body of the cylinder form the jacket, and is lagged with teak.

The two air cylinders, which stand on either side, but at a lower level than the steam cylinder, are 15in. diameter and 24in. stroke. They are driven from a quadrant, and all work in a direct line. The air valves are solid gun-metal boxes, with leather valves fixed on either side with iron weights, so that they can be readily removed, and new leather put in when necessary.

In order to get the best results from the air cylinders, these engines work at a very low speed, so that it is necessary to have an extra heavy flywheel, which weighs 4 tons 2 cwt., though it is only 7ft. diameter.

The glands throughout these engines are of a novel and improved construction : as the male portion is attached to the cylinder, the female portion is unscrewed to be let down to a rod, and packed, and so avoiding having to force the packing up from the under side. By this means these glands are kept tight with little or no trouble. A very substantial guide is fixed to the valve spindle, so as to take the side strain off the gland, and the position of the valve is adjustable from the under side.

To all working parts there are substantial oil cups, as these engines have to run over twenty-four hours at a stretch. On either side are two containers, one from which the air is pumped to form a *vacuum*, and the other into which it is pumped to *compress*.

Next we notice the telegraphic communication between the London office of the *Manchester Guardian*, situated in Charing Cross, and the head-quarters here. This is carried out by two wires in direct communication from office to office. All the other telegraphic messages received at York Street are dispatched to the *Guardian* and *Evening News* department by means of the pneumatic tube, underground, as already described.

After leaving the composing-rooms, the type when set is passed through an opening in the partition into a department where the most interesting operation connected with a printing office is carried on. This department is entirely separate in every way from the rest of the building, having its own manager or foreman, its own boiler, engine, shafting, and machinery.

The type, upon being received into the room, is looked over by the foreman, and the sheet to form the matrix, which is composed of various layers of paper placed together in a moist state, is placed upon it. This is carefully beaten with a brush, so that the formation of the type gives an accurate impression on the paper, the foreman carefully examining the work as it goes on to see that every letter is clearly moulded. A flannel cloth is then laid upon it, and it is passed through a rolling machine to insure evenness throughout.

After this it is placed on a hot plate under a screw-press, being left there for three or four minutes until the paper—technically

called the "matrix"—is dried. Again, it is rapidly removed from here and taken off the "forme;" it is again examined by the foreman, and in those parts where there is a considerable space not occupied by type small pieces of paper are pasted at the back to support the forme and to prevent the flattening of the matrix by the hot and heavy metal.

It is then quickly passed to the guillotine or shear, a simple apparatus in which it is cut exactly to shape. From thence it is placed upon another table, and the face of it is covered with French chalk to prevent the type metal adhering to the paper, all superfluous chalk being removed by being beaten by a switch. It is then immediately placed in a moulding box, which is an exceedingly ingenious apparatus, and gives the curved form required for the stereo. plate, so as to fit accurately to the cylinder of the printing machine.

In this box the matrix is placed and held firmly to the curve in the form of the mould by two side rings, which are easily removable for changing the matrix after the operation is finished.

The cylinder or core of this moulding box oscillates backwards and forwards, and is balanced by means of a counter weight. This cylinder or core is brought down facing the matrix and screwed tightly into position. Immediately the melted stereo. metal is poured in, and in order to expedite the cooling of the "git," so as to insure an even plate, pieces of cold metal are inserted into the top. The cylinder or core is then released and swung back, the stereo. plate adhering firmly, so as to be brought within the range of the travelling cutter, which insures the fit to this cylinder or core.

The plate is then released from the cylinder, by means of a dog placed behind it, which with a slight movement frees it from the cylinder core. The plate, while still hot, is placed in the thicknessing machine, which is of the annular form, with a revolving burnisher, which surfaces off the small ribs at the back of the plate, so that the plate itself shall be of an absolutely even thickness throughout. The plate is then dipped into cold water, and before it is actually dry, it is placed in an exceedingly

ingenious drop hoist, the invention of Mr. Braithwaite, the resident engineer of the establishment. This hoist we shall describe under its own heading.

This department is driven by a 10 h.p. locomotive boiler, constructed by Messrs. Marshall, Sons, & Co., Limited, of Gainsboro', made entirely of Bowling iron, and complete in every detail. It has double sets of very heavy water gauges, one lock-up and one Cowburn's safety valve, is lagged all over with wood and sheet iron, and fitted with a Borland's injector capable of working 100lbs. per square inch. It is exceedingly compact in appearance, and there is no inconvenience whatever from it in the stereo.-room. The motive power is derived from an 8 h.p. engine, made by Messrs. Marshall, Sons, & Co., Limited, 9½in. cylinder, 14in. stroke. The cylinder is constructed in two parts with a cold blast liner and lagged with sheet iron ; the crank shaft is of steel, and it has two flywheels to balance it. The engine is fitted with Messrs. Marshall's well-known automatic expansion gear, and goes perfectly steady with the most varying loads.

The general finish and detail of this engine are worthy special attention. The two furnaces in which the stereo. metal is melted are formed of wrought iron, with cast iron melting pots, and the same are covered with two steel sliding hoods, so that when the metal is being first melted the obnoxious fumes pass into the outer atmosphere, and so keep the stereotype-room healthy. These hoods are made from hammered steel, and are an exceedingly high-class job. The quality of the workmanship at the top is specially worthy of note. They were made by Messrs. Hudswell, Clarke, & Co., of Leeds, the manufacturers of the well-known wrought iron pulley. The line of shafting runs down the centre of the room, and is fitted up entirely with wrought iron pulleys with wrought iron bosses, and without key ways. The space of this room is somewhat limited, and the way in which the immense amount of plant is distributed, so that the men can get at their work without inconvenience, is worthy of notice.

Next to be described is the drop hoist, which connects the

stereo. department just described, which is at the top of the building, with the machine-room, which is two floors below the street, altogether a distance of about 77ft.

This consists of an iron box which just holds the stereo. plate, which is suspended by a steel rope over a pulley, and balanced by a counter-weight. This box runs in grooves lined with lignum vitæ, the counter-weight being 28lbs. to 30lbs. heavier than the box. The box in the stereo.-room is held between two steel jaws, and the finished plate, weighing about 60lbs., is placed in it and the two jaws released; the plates and the box being some 30lbs. in excess of the counter-weight runs down the 77ft. in about seven seconds. It is there caught between another pair of steel jaws and held until released by one of the attendants in waiting to move the plates from the box, and the balance-weight being then heavier brings the box back in about the same time that it took to come down.

Formerly, it was necessary to bring the plates down by the main hoist, and a loss of much valuable time was the consequence. Now the plates can be brought down as fast as ever they can be produced in the stereo.-room. The value of this apparatus cannot be over-estimated—and, I believe, it is the only one of its kind in the kingdom,—for by these improved means the whole of the time occupied from the time the forme is received from the compositors, including the construction of the matrix, casting the stereo. plate and finishing the same, then delivering by the drop hoist into the machine-room, is only eight minutes.

I will next describe the passenger or main hydraulic hoist, by which the old plates are brought up again from the machine-room into the stereo.-room for re-casting, and for the general requirements necessary for the department. This is known as one of Ellington's patent balanced hydraulic hoists. It has a $4\frac{1}{2}$in. steel ram about $7\frac{1}{2}$ft. long, and the cylinder goes into the earth about the same distance. It was constructed by the Chester Hydraulic Engineering Company. One-third of the water, each time the hoist is lowered, is saved by the hydraulic balance, and the other two-thirds going back into the main tank,

the handiness and steady running of this hoist cannot be spoken of too highly, and it is of the same class as those in the First Avenue Hotel, and the Hotel Metropole, London, and we believe it is considered one of the most perfect hoists of its kind now in use.

The next important department in due course, after leaving the stereo.-room, is the paper stores and wetting gallery. In this department the paper is received from the mills, and it will hold some 150 to 200 tons in store ready for use. The two wetting machines, and the hydraulic crane connected therewith, are of peculiar interest.

These machines were designed by Mr. Braithwaite, the resident engineer, and manufactured by the firm under his superintendence. They are exceedingly simple in construction and effective in their working.

It may be here mentioned that great difficulty is experienced in all parts of the country in the wetting of paper for reel machinery, and very often the makers of paper are blamed when the fault solely lies with the wetting machine, for, to give satisfaction, it must distribute the water evenly throughout the whole length and breadth of the reel, and also re-roll it ready for being placed on the printing press perfectly even and solid.

These machines, of which the general framework and detail are worthy of remark, show how carefully they have been considered in every point, so as to insure steady running and complete handiness ; for no sooner is one reel complete and taken out of the way by a hydraulic crane than a fresh one is put in, and these two machines have to wet paper sufficient for the whole of the requirements of the establishment.

The paper is placed on the spindle by them, and is prevented from over-running by means of a simple brake. It first passes under one roller and over the cylinder, and is re-wound by a revolving cylinder working on the outer surface of the paper, and by this means uniformity of the reel is insured. A tube with a large number of fine jets forces a spray of water against the plate, from whence it is directed against the paper, and is made into an even and fine spray, and in this lies the great secret of success.

Between these two machines is a very simple and neat hydraulic crane of the annular type, which has a 3½in. ram ; and as the space is exceedingly limited it has been attached to the floor above and below by a steel rod, 1¾in. diameter, passing through the ram at the bottom of the cylinder, firmly fixing it to the upper beam, so that the strain on this crane is divided between two floors. The jib of this crane is formed by two **V** irons and a little travelling carriage, which will lift half a ton, and the reel can be easily pushed along the jib by hand.

The paper, on leaving the wetting machine, is taken to the hydraulic hoist, which connects the paper gallery with the machine-room.

The boiler department next claims our attention. This is on the lowest level in the building, 30ft. below the street level. There are three 50 h.p. multitubular boilers of the locomotive type, constructed by Messrs. Marshall, Sons, & Co., Limited, of Gainsborough, made entirely of Bowling iron, with all holes drilled in position. Each boiler contains sixty tubes, 4in. diameter, and has an exceedingly large firebox for burning all sorts of fuel—shavings, chips, coke, coal, or waste materials. The working pressure is 90lbs., and they have an exceptionally elaborate outfit, each boiler having one lock-up safety valve, and a group of five Cowburn valves. They are lagged with wood and sheet iron, with a solid cast brass ring in front. The water gauge cocks are all connected together on each boiler by means of a rocking shaft, by which all four cocks can be turned off by one handle, at the side of the boiler. At the top of each boiler is a steam chamber, to which the stop valve of the main steam pipe is attached. Behind these three boilers are three multitubular feed-water heaters of the annular or double tube type—that is, a small tube rising nearly to the top of the larger tube, and the steam passes up the smaller and down the outer tube. Alongside of these are two double-acting feed pumps, with phosphor bronze rams. The water is forced through the feed-water heaters, where it nearly reaches boiling point before entering the boilers. These boilers and heaters are all coupled up, so that one, or two, or three

can be worked at will. In case of breakdown, any boiler can be thrown out and the others put on, and a very noteworthy feature here introduced by the consulting engineer, and one well worthy of imitation for similar confined space, is that all the connecting pipes between these boilers, pumps, heaters, &c., are entirely of copper, and by having large easy bends, all expansion joints are dispensed with, and the liability of breakage reduced to a minimum.

The general design and workmanship of these boilers are worthy of close inspection. The whole of the plates have been compressed into shape by means of the very elaborate hydraulic presses in use at Gainsborough, and the boilers are splendid examples of the very highest style of work which all the resources of a large and enterprising firm, controlled by the skill and varied experience of its talented principals, can produce.

On leaving the boiler-house, we enter the engine-room, which is partitioned off from the machine-room. Although some 27ft. below the ground, there is not a more elaborate or prettier engine-room in Manchester. In this room there are two 35 h.p. engines, also made by Messrs. Marshall, Sons, & Co., Limited, 19in. cylinders (lined with cold blast iron, steam jacketed and lagged), 36in. stroke. The engines are duplicate and not coupled, so that either engine can be set on to drive the place. This is accomplished by an exceedingly neat and elaborate system of friction gear; both engines run on to the hollow steel shaft from the 13ft. flywheel to the 7ft. 4in. wrought iron pulley below, and are brought into active contact with the main line of shaft, which passes through the hollow steel shaft, by means of Addyman's friction clutch. By these clutches either of the engines can be employed to do the work, or, in case of necessity, both; or both engines can be allowed to run round without turning the main line of shafting at all.

This general arrangement is well worthy of special notice, as it is an exceedingly cramped space; but it has been most carefully utilised, so that, in spite of all difficulties, there is plenty of room for the attendant to get at each bearing, both for oiling and

setting up. The gear of the friction clutches is worked by means of a lever with a screw passing through to the engine-house floor, so that the attendant in charge, without going below, can connect or disconnect either engine.

The cast iron standards for the pedestals are exceptionally neat, and at the same time are very massive, and while the power is passing through, there is not the slightest vibration. The lubricating arrangements of these main pedestals are duplicate—that is, the grease box is divided by a partition, one half for oil and the other half for thick grease, so that if the oil should at any time run short and the bearing get at all hot, the grease would be melted and run down and amply lubricate it.

The two 7ft. 4in. by 2ft. 1in. pulleys of wrought iron, made by Messrs. Hudswell, Clarke & Co., Leeds, also command special attention, as they run so remarkably true. They are exceedingly neat and light in appearance, perfectly rigid, and are, in fact, in every way superior to what a cast iron pulley could possibly be for this purpose.

The main driving belts, of leather marked "Griffin," are made of three thicknesses of leather 24in. wide, and as each piece of leather has been machined to a dead thickness before being put together, the belt from end to end is absolutely true.

The whole system of valves for starting these engines is brought up to the engine-house floor in the same way as on board ship. In the first place the driver or attendant opens the valve connected with the water box where any condensation of the steam passes, and sets in action a small ejector, which drains this box as well as all the pipes from the cylinder cocks There are two levers, one from each engine, for opening the cylinder cocks, which are each connected, and he can then turn on the main steam valve without moving his position.

The whole of the arrangements for this engine-house were constructed by Messrs. Marshall, Sons, & Co., Limited, of Gainsborough, including the floor and all its attachments.

The extreme solidity of the flooring is a striking feature, being formed of strong cast iron plates supported by H iron girders.

Between these plates and the girders is a thick sheet of india-rubber, which causes the plates to bend down, and prevents all rocking of the plates on the girders. Over each engine is a simple travelling crane capable of lifting three tons. It raises, lowers, and travels by power. Should any repairs become necessary to the engine, the hand ropes are placed upon the wheels of this, and can be set in motion in a few minutes, and any detail of the engine lifted off and travel down to the back end of the engine-house for examination or repairs.

A very simple and novel hand barring round gear is attached to each engine, namely, two small friction wheels placed in two short shafts hinged at one end, and when brought together at the other end by means of a right and left hand worm wheel clips on to the two outsides of the flywheel rim, and, when the friction becomes great enough, it turns the flywheel round.

Under each flywheel is a solid concrete bed, on which can be placed a hydraulic jack for lifting, without difficulty, the flywheel and main shaft.

The engines are carefully protected in every detail by very handsome handrails, with turned standards and polished brass rails. These are exceedingly strong and neat in appearance, and give a general finish to the whole arrangement. The openings in the cast iron for the belts, wheel, &c., to pass through, each have a combing of teak.

The engine-house complete has a most finished and mechanical appearance, and it would be well if a few other firms in the district would take a lesson from it, as they would very soon save the extra outlay in the convenience they would obtain.

Now we come to the most important and elaborate department of a printing office, namely, the machine-room. This, I believe, is the most extensive and elaborate of any in the kingdom, not even excepting *The Times* or the *Daily Telegraph*. In it are at present six newspaper printing machines, and in a short time there will be seven, each capable of turning out from 12,000 to 13,000 copies of the *Manchester Guardian*, and from 22,000 to 26,000 copies of the *Evening News* per hour.

All these are modifications of the well-known "Victory" type, and are the results of a series of experiments, extending over several years, made by the proprietors of the *Guardian* at their temporary premises in Blackfriars Street.

These machines are far too elaborate for me to describe to you all the minute details; but the paper, which is drawn from a reel, measuring about 4½ miles in length, passes through the machine in 22 minutes, and is printed on both sides, cut off, folded, cross-folded, and again folded, passing through different portions consecutively, and turned in, bundled, and, by a novel and exceedingly ingenious arrangement (the invention of Mr. Braithwaite), is counted into bundles ready to be handed out to the newsagents. Every motion in this machine is continuous and self-acting, and they have been brought to such an extreme nicety in this office that the stereo. plates, the moment they arrive in the machine room, can be dropped into their places, nipped up, and the machine set to work.

I must allude to a most marvellous detail in the way in which the results of races, elections, &c., are added. The stereo. plates are fixed on the machines ready for work, and if for races with an open space of sufficient area to contain the names of the first, second, and third horses, and the result is that within two minutes of the receipt of a telegram with the names of the winners, a supplementary type is dropped into this space and fixed by a spring, and the machine set in motion and copies delivered for sale in the public streets within three minutes of receipt of telegram.

The general design of these are worthy of consideration, each machine weighing from fifteen to twenty tons, and requiring from 12 h.p. to 18 h.p. to drive it. The great point of admiration is the accuracy and adjustment, the careful consideration of every moving and working detail.

I would request you to notice, however, a new "Victory" web printing and folding machine, which is an important advance in newspaper printing machines, it having been specially designed and constructed to print and fold newspapers of *various sizes*, either in the length or width of the sheet.

The machines hitherto used for newspapers must be made to suit a given size, and no other; that is, the circumference of the printing cylinder arbitrarily decides the length of the sheet that can be printed.

In this new machine the paper is drawn from the reel between a pair of rollers, which, by means of change wheels, are made to revolve at a quicker or slower speed according to the length the sheet is required, and when the sheet is cut it passes over a smoothing cylinder until it reaches the impressive or type cylinder, after which it passes on to a novel cross-folding apparatus, the special feature being the method of arranging the cross-folding cylinders so as to insure accurate folding, superseding the use of knives and rollers.

The first lengthway fold is made in the folding cylinder, and then the sheet passes on through tapes until it reaches the two cross-folding cylinders, which give it the first cross fold, and the sheet is then carried round a third cylinder, which gives it the second cross fold; after this operation it is placed on two flyers, which deliver the folded papers, duly counted into suitable lots, alternately on to two receiving tables ready to the hand of the attendant. If so required the folding arrangement can be readily disconnected.

About thirty years ago a rapid stride in general printing machines was made by the introduction of the now well-known "Wharfedale" stop-cylinder machine, made in Otley, Yorkshire, and since then this town has become noted for the production of this class of machines, which are much appreciated both in this country and abroad.

The special features in the "Wharfedale" machine which have made it a favourite generally among printers, are the crank motion for moving the type table, the stop-cylinder, the gripping arrangements, the feeding board, and the careful attention paid to the perfecting of the details, so that there is insured accuracy in printing in colours, and perfect register when the sheet is printed on one side and re-fed.

While retaining all the advantages of the "Wharfedale"

machine, much ingenuity has been shown to make what is technically known as a "perfecting machine," that is, a machine that will print *both* sides of a sheet at one operation; and the *Guardian* printing establishment have just completed a new "perfecting machine," made on their own premises, which is the joint invention of Messrs. Buxton, Braithwaite, and Smith, and has been designated the "Wharfedale Absolute Perfecter," and as this is the first one of its kind, and is the latest and most perfect development of a general printing machine, and the only one in existence to print *both* sides of a sheet with *one* revolution of *one* cylinder, it may be of interest to give you a brief description of, and the advantages claimed for, this new perfecting machine, namely :—

The connection of the type table and the cylinder by means of the racks fastened to the type table and geared with wheels at both ends of cylinder. By this means the finest printing can be insured without that tendency to smear which is often noticed in the other class of "perfecting" machines, in which the printing cylinder and table are geared one independent of the other, so that any irregularity in the running of the machine, or any play in the wheels or bearings, will cause a smear. Therefore, the advantage of having the type cylinder and table geared together will be readily understood.

The machine having only one cylinder for *both* impressions, it gives an open space at each end of the machine; thus the two formes, being open, are accessible for making ready or for corrections.

It has also a "stop cylinder," with loose wheel, the same as in the "Wharfedale" machines, which can be stopped at any time for running up the colour, or by the boy who is feeding, to prevent making a miss. This advantage will be readily understood and appreciated by printers, who would not think of having a jobbing machine without a stop cylinder.

Another great improvement is the steady action of the machine, for being driven by a crank motion it prevents any knock or "struggle" at the end of stroke, and gives an easy

pause and a silent return. This is a great advantage over the old "perfecter," which is driven by the well-known mangle motion, which was introduced on the first machine used by *The Times* newspaper, and has been very little modified since. This mangle motion causing the table to move backwards and forwards at one uniform speed, causes a vibration at both ends of stroke.

By a novel arrangement there is a perfect automatic "taker-off," which keeps the sheets quite straight, and they can be readily removed by the attendant.

Being less complicated than the old kind of "perfecting" machine, and possessing all the advantages of an ordinary "Wharfedale" machine, it will not only be economical in first cost, but it can be used for general jobbing of any kind, and print either in colours, or on one or both sides of a sheet.

The folding accurately of the sheets after being printed is a most important matter, so I call your attention to an exceedingly interesting "Automaton" folding machine, the invention of Messrs. Buxton, Braithwaite, and Smith, of the *Guardian* printing establishment, which is, I believe, the only machine in existence to-day, adapted to suit the folding of all classes of work. The object of the designers has been to make a double feeding folding machine to run at a high speed, and yet to insure accurate folding for all classes of newspapers, periodicals, pamphlets, bookwork, and general jobbing work, delivering the paper with either one, two, three, or four folds; and this machine amply realises all the objects contemplated by its inventors, and, by running the machine rather slower, it turns out the folding in a style not to be surpassed for accuracy by the most skilful hand-folding, though it is only fed by a boy or girl, as is done in letterpress machines, and the speed can be regulated to suit the smartness or skill of the feeder.

The novel features in this folding machine are the arrangement of two feeding boards with two folding cylinders, the top cylinder having one set of fingers to take the sheet off the top feeding board by the front edge (which has been laid by the attendant against the gauge) and brings the centre of the sheet over a knife fixed in the same cylinder, and, as the cylinder moves

round, the fingers release the front edge of the sheet and the knife inserts the centre of the sheet into a gripper in the bottom of the cylinder. This knife and gripper, commonly called "tongue and groove," was patented by Duncan and Wilson 15 years ago, and has been used in the "Victory" web printing and folding machine since that time; but this is the first time it has been applied to hand-fed folding machines, and the special advantages gained by using these folding cylinders are that the fingers take hold of the front edge of the sheet and do not release it till the first fold is made, so that the sheet, having got a correct first fold, is well able to resist the pressure when forced against the stop to take the next fold. This is a great improvement over any previous swift folding machine in which the paper runs direct against a stop *before* a fold is made, and the paper, sometimes being soft, causes a deal of trouble, and makes the fold inaccurate, thus making many "spoils."

The *first* fold—being the base line from which the other folds are given—is most important, and its perfect accuracy is secured by the cylinders I have just described. After the first fold has been given the sheet is released from the grippers in the bottom cylinder, and it then passes between top and bottom tapes, and receives the second, third, and fourth folds by knife and rollers similar to those in general use in other folding machines.

Round the machine-room is a small tramway, made of V iron, and on which are placed several trucks of very small dimensions (considering the weight they have to carry), and on these trucks the reels of paper are moved about to feed the various machines.

These trucks are of a novel description, having four little bogey carriages to each, the first two and the back two being coupled, so that with the least extra friction they will pass round very sharp curves. A boy is able to propel one of these, containing a reel weighing 10cwt., without the slightest trouble.

The ink for these machines, of which no small quantity is consumed every night, is taken from the main tank and distributed by a special means, which we shall describe hereafter.

At the end of each "Victory" machine is a small specially-constructed hydraulic hoist, which lifts the paper from the level of the floor into the bearings of the machine without the slightest trouble. This will also be described under the hydraulic system.

In the centre of the room are two large tables for piling papers ready to be carried to the printed paper hoist in the publishing-room, which again will be dealt with under a separate heading.

The general arrangement of this room, and the amount of machinery in the limited space, should be carefully noted. At one corner is the hoist for taking in the paper from the paper mills, which first lowers it on to the wetting gallery to be dealt with, and afterwards brings it down to the machine-room, where it is immediately rolled on to the trucks and distributed to the various machines. In the opposite corner is the hydraulic passenger hoist, by which the plates, after being done with, are returned to the stereo. foundry for re-melting.

In another corner is the drop hoist from the stereo. foundry, where the fresh stereo. plates come down. This room is entirely lined with white enamel bricks, and at night, under the effect of the electric light, is exceedingly pleasant to the view, brilliant in illumination, and cool and well ventilated.

We now notice the printed paper hoist, which is an exceedingly ingenious contrivance, schemed and carried out by Mr. Braithwaite, the resident engineer. There are two boxes hung over a pulley with a steel cord, each capable of containing a large number of papers. When one box is up the other is down, and so they are equally equilibrated.

The cord from the lower side of the box passes over a grooved pulley, which is in communication with a double-acting friction gear. The moment the papers are placed in one of these boxes the attendant pushes the handle, which brings the friction pulley in connection with the lift, and in two seconds the box is at the top. The descending box knocks the bowl out of gear, and at the same time becomes a brake.

A bell is rung as soon as the top box is emptied, and the attendant at the bottom filling the second box rings his bell in

return, and up goes the second quantity. These ascending and descending boxes work night and day, and carry the whole production of the machine-room into the publishing department. The expedition and convenience of this arrangement cannot be over-estimated, as the papers are handled without the slightest confusion, and dispatched to their various destinations with marvellous speed; yet there appears to be no confusion or excitement.

I will next describe the pneumatic pumping engines. These are of an entirely novel design, being more of the marine than stationary type. The space in which they had to be fixed was extremely limited, and as a large amount of power had to be obtained from a small space, it is worth while to note the general construction of the same.

The general arrangement can be gathered from the accompanying plans. It will be seen that the engines stand between two containers, one for the pressure and the other for the vacuum valve. At the top of one is a steel cylinder 16in. diameter and 24in. stroke, lined with cold blast iron, steel jacketed and lagged.

These cylinders are tied together by a rolled steel plate at the top and a cast iron girder on the under side, and the three cylinders are connected by a cast iron banjo frame, in which works the connecting rod which drives the flywheel, weighing 4 tons 2cwt. In order to keep steady there is a shoe guide on either side of large proportions, and a ram guide at the bottom, all of which are adjustable, so that the apparatus may run with perfect steadiness and solidity.

The valve motion is adjustable from the outside, and the spindle is guided by an exceedingly strong and substantial arrangement. The eccentric is attached to the disc plate, by which the engines can be run in either direction, and also the amount of cut-off regulated at will. The main crank-shaft is of steel. The main bearing, which supports the flywheel, is 18in. long and 6in. diameter, and this is an instance which shows how well worth while it is to put in a substantial bearing. Since these

engines started, some few months ago, the main bearing, though having to support a wheel of this great weight, has never slided in the slightest degree.

The most substantial lubricating arrangements are attached to every working part. Every part, namely, the valve chamber, the top and bottom of the steam cylinder, and the steam pipes are all carefully drained into the hot well.

Considering the immense amount of work these engines do, and the long hours they run, it is wonderful how steadily they work, and how accurate every detail must have been, from the fact that they come together without the slightest trouble. The pressure and the vacuum cylinders are of somewhat novel construction, the valves being of leather. Iron weight plates on either side are fitted on to gun-metal valve boxes, and should at any time a valve go wrong, which is not uncommon, the cover is taken from the valve chamber and the tightening screws released, and the valve box can be hauled out and a fresh one inserted with a new valve in its place, so that the stoppage can only be of a few minutes' duration.

The containers are of iron, the edges of the plates planed, and are a first-class sample of boiler making, being carefully stayed inside owing to the flat surface.

The covers of these are made of compressed steel, and have a very neat appearance, and seem to be an excellent fit.

The whole arrangement of these engines and containers shows that careful thought must have been expended upon them, and, I believe, this is the first case in which vertical pneumatic engines have been constructed without the ordinary beam, which in this case it was impossible to adopt, owing to the limited space. The most minute details of these engines have been carefully worked out, and I presume that the designer must have had reminiscences of marine engineering in his mind.

We now come to one of the most useful and unassuming systems in the whole establishment, namely, the hydraulic lifts, of which there are ten. Dealing as this concern does with between 150 and 200 tons of paper per week, it is absolutely necessary

for them to have some cheap, ready, and reliable means of raising and lowering this mass of material. It was decided to adopt throughout hydraulic appliances, and we think that there are few instances in the country where this system has been more generally and successfully carried out than the present.

In the first place there are a pair of pumping engines, which also had to be cramped for space, as follows: 10in. steam cylinders, 12in. stroke, steam-jacketed, lagged and unlagged, of the tandem type, with the pumps behind, which are of the double-acting single valve type—that is, as the ram is drawn from the cylinder, it takes in an amount of water from the feed system. On its return half of the water is compressed into the accumulator, and the remaining half into the annular space at the fore end of the pump, being brought into direct communication with the accumulator. On its outward motion this half that is confined is forced in the accumulator, and the back end of the pump is filled with fresh water. By this extremely ingenious method, which was the invention of Sir W. Armstrong, in the first place, we get a pair of double-acting pumps with only one pair of valves. These pumps start and stop themselves, according to the position of the accumulator; the moment the accumulator ascends to its utmost limit, it drops.

As soon as the accumulator has ascended 2in. the throttle valve is opened and the pump set in rapid motion. By this means the action of these pumps is entirely automatic. The steam supplies to this are as follow: There is a steam pipe supplying each cylinder, at the top of which is an equilibrium throttle valve. Attached thereto is a gun-metal stop-valve behind, which is connected from the main steam pipe to the two steam pipes supplying the cylinder.

So, prior to starting the engines, the valve connected therewith can be opened, condensed water blown through the steam ejectors, then the main stop valve can be opened and the engine started.

These force the water into the accumulator, which is also of a novel type. Instead of the cylinder rising and falling, and the

ram being a fixture, the cylinder has been sunk into the earth, and the ram, with 37 tons of iron at the top, rises and falls. There are several advantages in this arrangement: a greater travel of ram is gained, and the lubricating arrangements are better, as the use of the ram runs down in the space above the gland and re-lubricates the ram at every stroke; the weights are carefully steadied by V guides on either side. In front of this accumulator is a neat arrangement of loose valves, which, should by any mishap the accumulator get too high, it lifts, and sets free the excessive amount of water. From this accumulator, beneath the machine-room floor on the paper gallery, are solid weldless pipes. At every short distance a T piece is fitted in the same with a plug, so that at any time, should further hydraulic power be required, instead of having to start the present arrangement of pipes, one of these plugs will simply have to be removed from the T pipes and the connections made.

On the opposite side of the building is the main hydraulic passenger hoist, which ascends some 77ft., and is what is known as Allington's patent hydraulic hoist. Thus the water from the accumulator acts upon a differential ram, and being of an excessive pressure, forces the hoist to the top of the building. On its descent, instead of the whole of the water thus compressed being lost, one-third is returned to the accumulator, and the remaining two-thirds to the supply tank. This balanced hoist is of an exceedingly ingenious construction. It runs exceedingly smooth both up and down, and is readily under the control of the attendant, and is an immense gain over the old-fashioned chain hoist, and far safer.

The next most important is the ingenious jib crane between the wetting machines, which has already been described. At the end of each paper machine pit is a pretty and simple hydraulic paper hoist, which is capable of lifting 12cwt. of paper twelve inches high. These were designed and constructed by Mr. Francis B. Welch. They consist of a simple cylinder on a standard, with gun-metal rams, having a solid check collar to prevent them rising too high.

The whole arrangement is very get-at-able, neat, and strong. These are controlled by hydraulic stop valves, which are well worth carefully examining, being of an exceptionally good design, and ready as far as work goes.

The whole of the hydraulic system has proved a very great assistance to the expeditious working of this office, and there is every reason to believe that in a short time it will be considerably extended for other purposes in the building.

Hydraulic System.

Perhaps the most complete and extensive hydraulic system is introduced into this building of any newspaper offices in the Kingdom. In the electric light room in one of the rises there is an accumulator, 14in. stroke, 12in. ram, which gives a pressure of 700lbs. per square inch, and is supplied with water from a pair of tandem pumps of the "Duplex" system, with one pair of valves, invented and generally introduced by Sir William Armstrong & Co., Newcastle.

These pumps are driven by a pair of engines having 10in. cylinders, steam jacketed and lagged, and with a very neat slipper guide, the bearings being entirely of phosphor bronze, and they have a substantial guide for the valves and lubricators to all working parts, designed by Francis B. Welch.

All round the machine-room and into the paper gallery is a complete system of compressed steel weldless pipes.

At every few feet is a T piece fitted with a plug, so that should at any time a further hydraulic power than that which is at present installed be required, one of these plugs has only to be removed and a connection made.

The first supply of water goes to the passenger hoist already described, and then round the room. At the back end of each machine is a small hydraulic hoist for lifting the reel of paper into its bearings. These consist of a cast iron cylinder beneath the floor, with a solid gun-metal ram, $2\frac{5}{8}$in., with gun-metal glands, the table being of the box type, and rises to 1ft. in height,

where there is a permanent stop to prevent over-lifting the ram. The framework of the table is of cast iron, the top covered with polished teak, and the sides lagged with pitch pine, to prevent any of the employés putting their feet underneath the table when up.

By means of these hoists a fresh reel of paper can be put in the machine ready for work in a few seconds, and when this is done the hoist falls down to the level, and forms part of, the floor.

On the left-hand side of the machine-room, coming from the electric light department, is the main paper hydraulic hoist, with a 3in. steel ram. This hoist lifts from the lower machine-room floor, first to the paper gallery, then up into the street level. By this hoist all the paper is taken in for the various departments. Over this hoist is a pair of doors, which close by means of a worm wheel attachment to the machine-room, and when let down make a fence in the street to prevent any accident to passers-by.

The inside door is first opened by means of the above-mentioned attachment, and the second follows, so the opening of the hoist at the street end is entirely closed in.

The hydraulic hoist ascends to the top end of these doors, which is about 3ft. from the pavement; a small bridge is put across the intervening space to the cart or lurry, and the reels of paper are easily rolled from the road vehicle on to the hoist.

The whole arrangement is exceedingly simple, and very effective for the class of work it has to carry out.

The hydraulic valves throughout the whole of the hoist, with the exception of the main hoist, are of the lever stop valve type, with a stop valve at the top in case of accident. They are made entirely of gun-metal, and have been designed and constructed by Francis B. Welch & Co.

The building throughout is lighted by electricity. The plant consists of about 600 incandescent lamps and nine "Sun" lamps. At present only four of these are in actual work. Three of the "Sun" lights are in the machine-room and one in the advertising-room. The incandescent lamps are placed all over the building.

This plant is driven by a 35 h.p. nominal Marshall steam engine, 9in. cylinder, 12in. stroke, and of the exact design and details of the main engines. It drives on to the counter-shaft in the wall, and from thence to the various machines.

The incandescent electric power is obtained from three Edison-Hopkinson dynamos, of special construction. These were designed for this installation, and are a particularly handsome job throughout, the framework and main bearings being very substantial, and the lubricating arrangements exceedingly complete.

Any excessive oil used on these bearings passes down the sides of the passages into a collecting box at the bottom, and can be drawn off.

These machines are mounted on three travelling teak frames, that insulate the machine from any leakage of electricity to the earth, and at the same time you are enabled to traverse the machines through from the pulleys, and so tighten the driving belts. This arrangement has already proved an immense convenience, as belts can be actually tightened while the machines are running. This arrangement of table and tightening gear was designed by Francis B. Welch, and was first made for Messrs. Ralli Brothers for their electrical arrangements at their warehouse in Peter Street, Manchester.

A switch board is also fixed in the same room, and is a very pretty piece of work, complete in all details. Throughout the building are distributed, as before stated, about 600 incandescent lamps of the Maxim-Weston type. These were selected after very careful consideration, from the excellent quality of the light they give, the small amount of power considering the amount of light and the general pleasant appearance of the lamp and its surroundings.

These lamps, nominally 50-candle power, are worked up to about 34 to 36-candle power.

We next come to the electric "Sun" lights, which are of a novel and exceedingly interesting description. The light is obtained by a current of electricity flying across a small block of marble, which becomes so intensely heated as to become luminous.

These three lights are worked by an alternating gramme machine, excited by a smaller gramme, and they burn with the utmost steadiness, and give a fascinating, soft, and steady light. The benefit of this type of light for printing purposes is that the rays are all thrown downwards, and it is a matter of wonderment that more of these lights have not been introduced for similar purposes, as they give little or no trouble, and the light is all that could be desired.

The letter-receiving office being situated in the centre of the building, considerable difficulty was experienced in bringing the answers to advertisements to this department, and Mr. Taylor, one of the firm, suggested the idea that some mechanical means should be contrived so that this could be effected by continuous travelling bands. This suggestion was carried out, and there are two of these at work—one at the office of the *Guardian*, and one at the *Evening News*. The letters are posted and drafted in the space, and they fall down till they come between the continuous travelling bands. They are conveyed along under the floor and up into the clerks' office, where they are discharged into a basket. From the moment of the letter being posted and carried into the office it is only a matter of a few seconds.

These run night and day continually, travelling with the letters as they come in. The sides of these are fitted with glass, so that should a letter stick it can be at once seen, and can be got at. We believe this is the first and only case of its kind in existence.

Great trouble has been experienced for many years in the machine-rooms with ink cans, the men having to remove the ink from the cans to the ducts by means of a palette knife. This caused a deal of delay, and so Mr. Braithwaite, who has had large experience in this department, set about to scheme a readier and cleaner means of distributing the ink to the various machines. On the paper gallery, he has a large tank holding about 1,000 gallons, into which the ink cans are emptied on coming into the building, and a pipe placed at the bottom of this tank has a valve.

At the bottom end of this pipe is a treacle-cutter, the same as

is used in grocers' shops. A travelling ink can, made with a copper casing, with a funnel top and screwed down cover, on travelling wheels, is drawn underneath this treacle-cutter, which, on being opened, fills the can with ink. It is then stopped, the cover placed and screwed down very tight, and by means of a small air-pump at the side, compressed air is placed in until sufficient to expel the ink from the can. Besides the can is a copper pipe with the well known joint and overhanging arm, at the end of which is another small treacle-cutter.

The compressed air forces the ink out into a duct, and when full the treacle cutter is closed and again passed on to the next machine. Speed, cleanliness, and handiness are thus gained.

Throughout the building a complete system of fire-extinguishing appliances are fixed. Up the back staircase is an uptake pipe, with attachments and holes in every landing, the same on the front and other staircases throughout the building. The water is always on, and a proof of the handiness of the general arrangement was given a few Sundays ago, when the place was empty of employés. Some cotton waste accumulated which had been carelessly thrown behind a box, and set fire to a portion of the building. But for the promptitude of the fireman and the handiness of the arrangements, a serious conflagration would have been the result. As it was, in less than three minutes the whole was extinguished, and luckily the damage only amounted to a few hundred pounds.

In the machine-room is a neat and exceedingly light "Goliath" crane, made entirely of iron tube, which can all be taken to pieces and readily stowed away. It travels on four rollers, and is used for lifting the cylinders from the printing machines, which weigh between one ton and 30cwt. each. This crane, capable of lifting two tons, can be moved about the room by two men. The cross-beam is a 4in. ordinary steam tube, filled with oak, with a $\frac{7}{8}$in. steel rod through ; so that, should the tube by any chance crack, the oak in compression and the rod in tension would still support the weight. This crane can be wheeled about over any machine at a minute's notice.

Having trespassed so much on your patience, I must thank you for your kindness and attention, and I trust that the only apology I need make for the lengthy address you have so indulgently listened to is the fact that it is the first time this important subject has been brought before our Association, and however poor, feeble, and unsatisfactory my labours have been, you will have the satisfaction of seeing the work of a huge and complete establishment, and I am confident that your verdict will accord with my own, that the present proprietors of the *Manchester Guardian* have carried out, and are still doing so, the sentiments contained in the editor's leader in the first impression in 1821 :—

> We believe that, by industry and attention, by displaying a wish to cater judiciously for the public taste, and to contribute, however humbly, to the public improvement, the success of our undertaking may be secured—that we shall obtain that support which we do not expect, and, in fact, ought not to wish for, on any other terms.

And, while I ask you to join me in expressing our hearty thanks to the proprietors and engineers of the *Manchester Guardian* for their extreme courtesy and favour, we couple with it our best wishes for the continued success and prosperity of so powerful and valuable a newspaper, and I now close with the words of the poet :—

> Behold the Press, from which pure fountain springs
> The talent that upholds the throne of kings,
> Whilst Lords and Commons guide the helm of state,
> Law and Religion guard the queenly seat.
> Thus the Quaternian, decked in robes of power,
> The Throne protect when storms and tempests lour.
> View England, whilst in slavery's chain fast bound!
> What banished Superstition from our ground?
> Even Lords and Commons, from their high degree,
> Would sink to nothing, once deprived of thee.
> Thou art the rock, 'fore whom the virtues stand,
> The Press,—the Guardian of our native land.

The CHAIRMAN said they all expected that what Mr. Ashbury took in hand would be thoroughly well done, and, from their previous experiences of his interesting and instructive subjects, they anticipated to have that evening another treat, which had been abundantly verified, and Mr. Ashbury had earned their warmest thanks.

It had occurred to him that, though printing appliances had made such wonderful development, there was one thing which he thought had not improved, and that was the ink, when compared with that which had been lately found in the papyrus taken from Egyptian mummies, and which was perfectly legible at the present day.

Referring to the rapidity with which newspapers were published, he said it reflected great credit not only on the printers' engineers, but also on the newspaper staff.

Mr. ROBT. RAWLINSON, in proposing a vote of thanks to Mr. Ashbury, said the members could not fail to have been struck with the consummate mastery which Mr. Ashbury had of his subject, and said it was the pioneer paper to an interesting visit which was to take place on the following Monday.

Mr. ALDERMAN BUCKLEY (of Oldham) said he had great pleasure in seconding the motion, and he thought they would all agree that Mr. Ashbury must have devoted considerable time and attention to have put the matter before them in so interesting a manner.

With respect to improvements made in the *Manchester Guardian* printing appliances, he said they could not look at that in a scientific sense from a purely engineering point of view in the same light as they regarded our great ocean going steamers ; but they would associate them with a power which was even greater, namely, that of providing food for the mind, and he was sure they were not only creditable to those who designed and executed them, but also to the City of Manchester.

When he thought of the power encompassed in that establishment, he was reminded very much of the lines of one of our poets—

> The god of minds, made all minds free,
> And its birthright is liberty;
> The thoughts of men no power can bind.
> Limbs may be changed, but not the mind.

Mr. ASHBURY briefly acknowledged the vote of thanks, and said he must again express his thanks to Mr. F. B. Welch and Mr. D. Braithwaite for the assistance given him in preparing the description of the machinery at work in the *Manchester Guardian* establishment.

Mr. F. B. WELCH replied, expressing his great appreciation of the paper he had just listened to, and was astonished at the grasp and thoroughness with which the subject had been treated.

The meeting then closed.

By special invitation the members, to the number of nearly seventy, met at the offices of the *Manchester Guardian*, Cross Street, Manchester, at 3 p.m., on Monday, November 30th, when they were introduced by Mr. Thomas Ashbury (past president) to Mr. Buxton, representing the proprietors, under whose courteous and explicit guidance they were conducted over the whole establishment, assisted by Mr. Russell Allen and Mr. Buxton, jun. (sons of the proprietors), Mr. F. B. Welch, the consulting engineer, and Mr. D. Braithwaite, the resident engineer.

After a thorough examination of the plant and appliances, which proved exceedingly interesting and was intensely enjoyed, the members assembled together to express their deep obligation for the treat afforded them.

Mr. THOMAS ASHBURY (the past president), in proposing a vote of thanks to the proprietors of the *Manchester Guardian* and the *Evening News*, said it was during his presidency, now twelve months since, that he obtained the courteous and prompt permis-

sion for the members of the association to visit their printing establishment when it was complete, and on announcing this proposed visit a suggestion was made that it would be interesting if he (Mr. Ashbury) would prepare a paper on printing, and so at the request of the Council he reluctantly consented to take up the subject.

The visit having followed the reading of this paper, he was confident the introductory remarks which he had been able to give them respecting the *Guardian* printing establishment had found an efficient and satisfactory realisation in their inspection that afternoon, for, as engineers, they had been delighted to see such efficiency, combined with a marvellous economy of labour.

Their obligations had been increased in having been favoured with the presence and guidance of a member of the firm, together with the consulting, and also the resident engineer, during their tour of inspection, and it now gave him very great pleasure to ask them to signify their appreciation of the favour shown them by according a cordial and unanimous vote of thanks to Messrs. Taylor, Garnett & Co., and he begged to couple the name of Mr. Buxton for the *Manchester Guardian*, and Mr. Russell Allen for the *Evening News*.

Mr. JOHN CRAVEN, in seconding the motion, said he had nothing to add to the previous speaker's remarks, except to say that he heartily indorsed them, and that he was sure, to a Society of Mechanical Engineers like their own, the interesting details and appliances which had been shown to them could not fail to be appreciated.

Mr. BUXTON replied on behalf of the proprietors of the *Manchester Guardian*, and regretted very much the unavoidable absence of the senior resident partner, Mr. Allen, who, he said, would have given them a most cordial welcome.

He was sorry that the pressure of business prevented him from showing them more fully the details of working a newspaper, but they would readily understand the difficulties which prevented it. He believed, however, that even the superficial

inspection which they had been able to make, would enable them to comprehend more fully the manner in which newspapers were made and produced.

Referring to Mr. Ashbury's paper, he said during the short time he was able to be present at the reading of it, he had been greatly surprised at the really valuable information which was being given to the Society, and it would, when printed, be invaluable as a reference to the members.

With respect to their present premises, he said they had hardly been there twelve months, so of course they would not expect to have all the mechanism and appliances ready to be subjected to such a critical audience as that of the Association.

In reference to the advance in printing machines, he said there was no doubt that within the last twelve months rapid strides had been made; in fact, to such an extent that they who were intimately connected with the working of a newspaper, had almost come to the conclusion that they had reached the end of their tether, and that it seemed almost impossible to make any further appreciable progress; but still, day by day, they noticed, as they arose, any little weaknesses which required adjusting, and in endeavouring to rectify them they were often enabled to effect useful improvements. In conclusion, he said the firm had several valuable adjuncts in process of development, and these, he believed, would render their machinery equal, if not superior, to anything of the kind extant.

Mr. RUSSELL ALLEN explained the absence of his father in Wales, and suitably responded on behalf of the *Evening News*.

Mr. J. HORSLEY next proposed, in complimentary terms, a vote of thanks to Mr. F. B. Welch, the consulting engineer, and to Mr. Davies Braithwaite, the resident engineer.

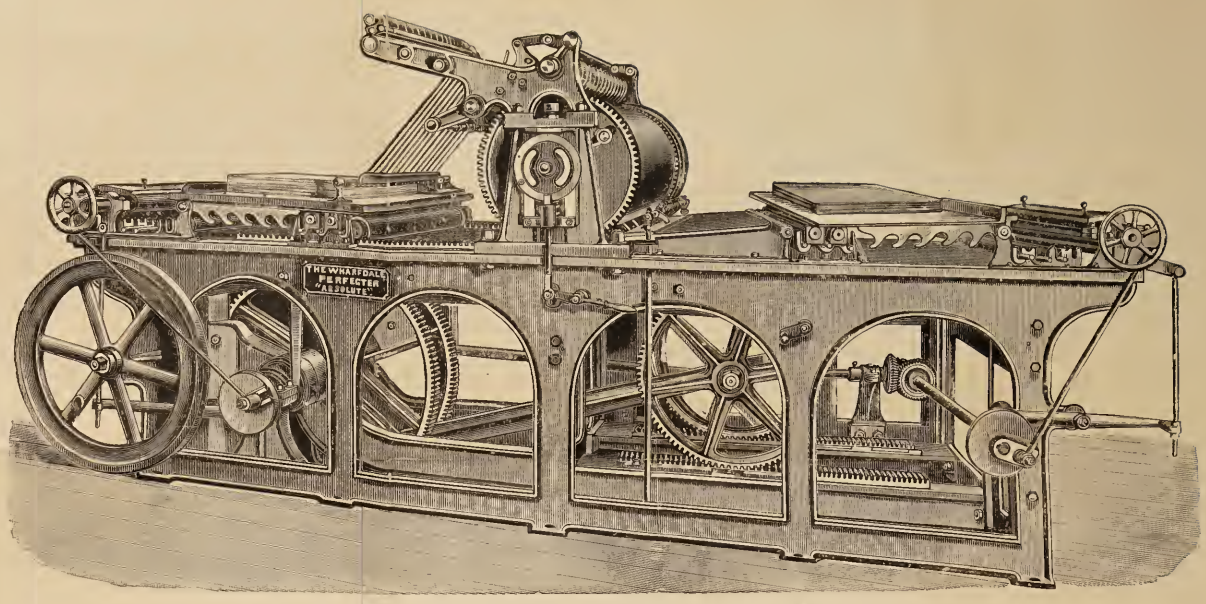
Mr. ROBT. RAWLINSON, in seconding it, said the engineering appliances which had been shown them that afternoon had opened their minds to the fact that there were vast

opportunities for the exercise of ingenuity in other branches of engineering than that with which they were particularly associated.

Mr. F. B. WELCH, in responding on behalf of Mr. Braithwaite and himself, said he happened to be a member of the Association, and there was nothing which gave an engineer more pleasure than praise from a brother engineer; but he might tell them that Mr. Braithwaite and himself were greatly indebted to the firm for the plucky manner in which they had backed them up in their efforts, both in money and advice, and this was no small affair when they considered that all this capital and enterprise had been based simply on the assurance of two men, Mr. Braithwaite and himself.

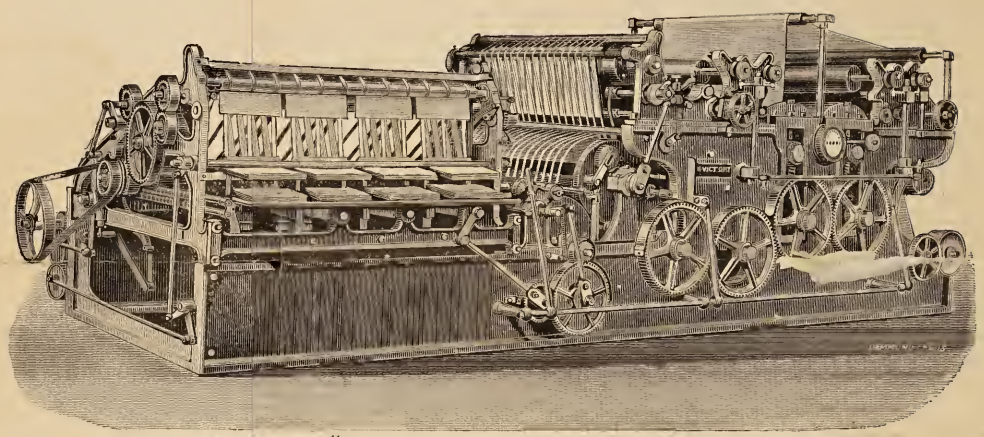
The members then separated with one united expression of pleasure and satisfaction at their afternoon's visit.

Guardian Printing Works, Cross Street, Manchester.

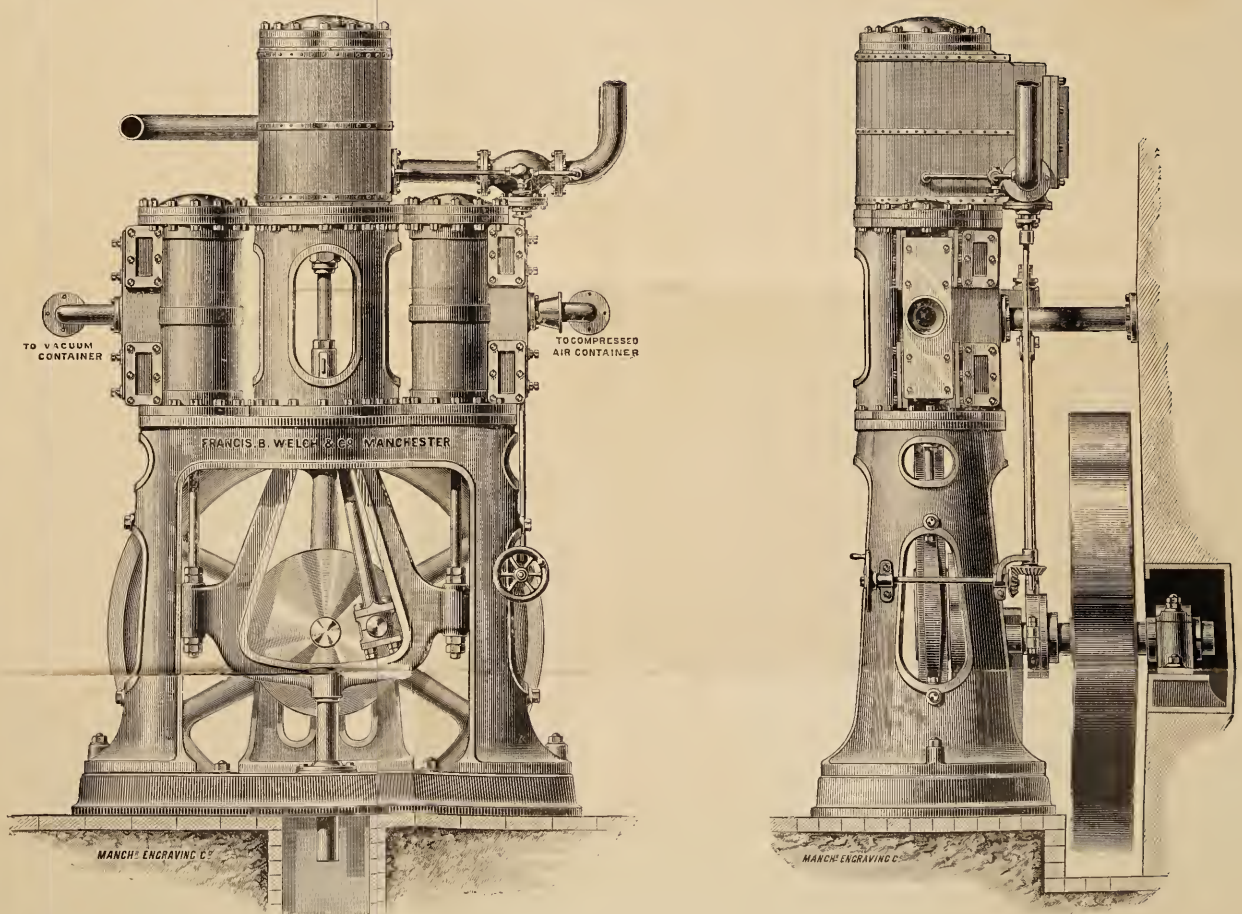


THE WHARFEDALE ABSOLUTE PRINTING MACHINE.

BUXTON, BRAITHWAITE, & SMITH'S PATENT.



THE IMPROVED "VICTORY" NEWSPAPER PRINTING MACHINE



THE PNEUMATIC PUMPING ENGINE.

F. B. WELCH'S SYSTEM.